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Title: The CCEDRRN COVID Mortality Score to predict death among non-palliative COVID-19 patients presenting to emergency departments: a derivation and validation study
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Reviewer 1
General comments (author response in bold)

This is an interesting paper from the CCEDRRN study group of non-palliative COVID19 patients presenting to the emergency department. The authors developed a rule that predicts death in the ED or in hospital. The major factors associated with death were age and respiratory status. The model which contained 8 variables in total had excellent discrimination.

1. The major issue with this paper is that deaths after ED discharge or deaths that occur out of hospital after hospital discharge are not known. Therefore, it does not include patients who were discharged home and subsequently died, which would miss a potentially significant number of deaths. Do the authors know what percent of 30-day deaths were missed from their cohort, by telephone follow-up or data linkage or some other means?
Our primary outcome was in-hospital mortality because we were unable to link our dataset with vital statistics data. Clinicians are unable to intervene in patients who do not come to hospital in the first place, so it does not make sense to enroll patients who never presented to hospital. We are currently developing a discharge rule which will address exactly this reviewer's concern, and aims to predict poor outcomes after discharge.
Of note, we enrolled multiple hospitals within the same regions increasing the likelihood of capturing readmissions to other centres. The proportion patients readmitted after ED discharge in our dataset was only 1.2% in the first wave, and 1.0% in the second wave. This indicates that the rate of poor outcomes after discharge was low in our cohort.
We have acknowledged in the limitations section that we were unable to capture out-of-hospital deaths.

2. Another major issue is how should doctors care for patients differently based on the score? Without a clinically relevant impact on care, the enthusiasm for the score is reduced.
There are two main ways in which we anticipate this rule will be used:
- **This rule can inform level of care conversations with patients and their families to ensure patients and families are aware of their mortality risk when they make level of care decisions. Our rule is unique in enabling this information to be available in the ED at the bedside with variables that would be available on arrival, and before intubation decisions are made. Critical care physicians and patients on our team have confirmed that this will be valuable to their practice.**

- **In unfortunate situation where and when critical care resources are overwhelmed, as is currently the case in the province of Alberta (written on Sept 16th after triage of critical care resources was announced in the lay press), a reliable, highly accurate rule is needed to inform rational resource allocation.**

3. The limitations state that deaths outside of hospital were "believed to be rare". Provide papers that show that out-of-hospital death was rare at the same time during the pandemic and cite or remove this statement because it is a substantial limitation.
We have removed this statement.

4. If the model only predicts in-hospital death, what should clinicians use the risk score for? Specifically, does it tell us who will die outside of an ICU?
This score tells us with high accuracy who will die in hospital (ward or ICU) despite maximum medical therapy, and in whom maximum medical therapy will be futile. This is relevant to inform level of care conversations with real-world data. In addition, the CCMS is relevant to situations when critical care resources are overwhelmed, as has occurred in multiple jurisdictions around the world, currently in Alberta. Medical ethicists in multiple Canadian jurisdictions have developed triage guidelines for this situation but their application necessitates validated mortality prediction model. The CCMS fills this gap.

5. The model for mortality prediction does not account for care processes for the patient. For example, what was the proportion of patients who died in the ICU vs. ward/ED?
In the first wave 0.5% of patients died in the ED, while 0.2% died in the ED in the second wave.[3]. We did not collected data on how many patients died in the ward versus ICU. Patient outcomes are the results of the processes and treatments that patients received. We have described these in another paper which we have added to the results section and to the reference list.

6. How were palliative care patients identified and excluded from the study cohort?
We abstracted code status from the medical records of the patients. If the patient's code status was not documented, we assumed that the patient was a full code.

7. Were patients who were not palliative, but were DNR, included in the study? If they were included, how did DNR status impact the score performance – stratify by DNR vs. no DNR status.
DNR patients were excluded from this study in order to not bias the study with self-fulfilling prophecy bias (see answer to comment 26).[4]

8. It is known that patients who are from nursing homes had higher mortality. It would be interesting to know if the analysis is stratified by nursing home status, does the model continue to predict well?
In table 2 we present the odds ratios associated with where the patient lives ("Arrival From"). Living in an institutional setting (which were mostly non-palliative long-term care residents) was associated with mortality (OR 1.8; 95% CI 1.38-2.35) and is in our model. Other factors were more important predictors.

9. What was the AUC for a model that includes only age, resp rate, and oxygen status? If these 3 factors predict well, the need for a 8-factor risk score might be obviated.

We used a methodologically strong and objective approach to arrive at the most parsimonious model. If those three factors were all that were needed then the fast step-down approach would have arrived at that model.

10. Future directions section in the discussion is not relevant to this study and should be removed.

We have edited this section.